Nanoindentation of Thin Glass Fibers

Lönnroth, Nadja Teresia; Pantano, C.; Yue, Yuanzheng

Publication date:
2005

Document Version
Accepted author manuscript, peer reviewed version

Nanoindentation of thin glass fibers

N. Lönnroth*, C. Pantano° and Y. Z. Yue*

*Department of Life Sciences, Section of Chemistry, Aalborg University,
Sohngaardsholmsvej 57, DK-9000 Aalborg, Denmark
°Department of Materials Science and Engineering, Materials Research Institute,
The Pennsylvania State University, University Park, PA 16802, USA

Abstract

Nanoindentation has been used to determine hardness and elastic modulus of glass fibers with diameters in the range of 5-20μm. The samples include both continuous E-glass fibers and stone wool fibers as well as a bulk basaltic glass sample. By experimenting on mounting techniques and indentation procedures it has been possible to get consistent data on the fiber samples. This provides a direct tool to characterize the intrinsic mechanical properties of thin fibers. Fibers, indenpendent of the composition, show a tendency of increasing hardness (H) and elastic modulus (E) with increasing fiber diameter. This shows that the cooling rate effect on glass structure can be characterized by nanoindentation measurements. Indenting the cast surface of the bulk basaltic glass, shows a surface layer with a depth of 100 nm that has higher H and E than the interior glass. Further experiments are planned to be carried out in order to gain more information and better understanding on the observed phenomena.